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Personal private herbaria: a valuable but neglected source of floristic data. The case of Italian collections today

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Abstract

Today private collections still represent an important source of information as is evident from the available literature, where, in many cases, private collections are mentioned both in floristic and taxonomic/systematic researches. We present a summary of the main information about private herbaria in Italy, whose collections are currently increasing. Based on our survey, we retrieved information on 34 personal herbaria where 156,361 specimens are preserved at present. Piedmont and Tuscany resulted the two Italian regions with the highest number of collections, whereas for 9 regions we obtained no answer. The most represented families resulted Asteraceae and Poaceae, whereas the most represented genera resulted *Carex*, *Trifolium*, and *Hieracium*. Taken all together, these collections rank 16th among the 68 institutional public herbaria officially recognised in Italy.

Keywords

Herbarium specimens, Italian botanist, plant collection, floristic data

Introduction

Private herbarium collections have represented the starting point for the establishment of many of the still-extant natural history museums around the world. In the 17th and 18th centuries, the fashion for collecting plants resulted in the amassing of large private collections, which later became the basis of institutional collections (Stearn 1971). Thus, the Oxford University herbarium (OXF, acronyms follow Thiers 2016)

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was largely formed from the private herbaria of Jacob Bobart the Younger (1641–1719), William Sherard (1658–1728), Henry Barron Fielding (1805–1851) and George Claridge Druce (1850–1932) (Clokie 1964, Stearn 1971). The Natural History Museum of London (BM) owes its foundation to the tireless activity of Sir Hans Sloane (1660–1753) and Sir Joseph Banks (1743–1820), whose houses quickly become too full to accommodate their collections (Beer 1953, Stearn 1971). Likewise, the herbarium of the Royal Botanic Gardens, Kew (K) started to develop from the private herbaria of Sir William Jackson Hooker (1785–1865), George Bentham (1800–1884), and William Arnold Bromfield (1801–1851) (Stearn 1971). In Italy, there are 68 institutional public herbaria (Taffetani 2012), many of them hosting significant collections donated by private collectors. These collections represent an important part of preserved plant specimens. The herbarium of the University of Florence (FI), currently preserving more than five million samples, hosts the private collection of its founder, Filippo Parlatore (1816–1877), composed by about 300,000 specimens (Cuccuini 2009), as well as other private collections. Among these, one of the most important is the herbarium of Philip Barker Webb (1793–1854) (FI-W), counting about 250,000 specimens, and purchased in the 1855, by the then curator Filippo Parlatore (Moggi 1993, Nepi 2009). The herbarium of the University of Pisa (PI) hosts nine main private collections, donated to or purchased by the university and detached from the general collection (Amadei et al. 2007, 2012). Among these collections, noteworthy are the herbarium of Pietro Pellegrini (1867–1957), composed by 22,000 specimens, mainly from the Apuan Alps (Garbari and Del Carratore 1993); the herbarium of Teodoro Caruel (1830–1898), counting about 14,500 samples representing a valuable document related to his "*Prodromo della Flora Toscana*" (Caruel 1860); and the herbarium of Michele Guadagno (1878–1930) with gatherings mainly from southern Italy.

Private collections are preserved also in other Italian public institutions like civic museums or schools. To name but a few examples, the herbarium of Giovanni Montini (1802–1854) is preserved in the Civic Museum of Bassano del Grappa (Lasen and Busnardo 1993); the herbarium of Pietro Zangheri (1889–1983) is currently preserved in a specific section of the Civic Museum of Natural History of Verona (VER) (Viciani 2011); and the three herbaria of Erminio Ferrarini (1919–2002), overall composed by 8655 samples, are now preserved in the high school "Guglielmo Marconi" of Carrara (Tuscany), the natural history museum of the Lunigiana (Aulla, Tuscany) and in FI (Maccioni et al. 2008).

Today, private collections still represent an important source of information. This is evident from the available literature where, in many cases, private collections are mentioned both in floristic (e.g. Bartolucci and Peruzzi 2007, Anzalone et al. 2010, Selvi 2010, Peruzzi et al. 2011, 2016, Roma-Marzio et al. 2016, Ardenghi and Polani 2016) and taxonomic / systematic researches (e.g. Brilli-Cattarini and Gubellini 1986, Iamonico 2015, Peccenini and Polatschek 2016).

In this paper, we make a first attempt to summarize the main information about private herbaria currently preserved in Italy.

Material and methods

We defined as private herbarium a collection of dried vascular plants, continuously increased with new gatherings, and independently managed by a private collector, without support from any public or private research institution. We excluded the institutional herbaria listed in the *Index Herbariorum* (Thiers 2016), and all the herbaria maintained in the public bodies such as educational institutions, regional and national parks, libraries and public archives.

In order to obtain data from Italian private collections of plants, we prepared an on-line questionnaire based on a Google module. The questionnaire included 17 questions (15 with a free-text answer and 2 with a multiple-choice answer), focused on the herbarium name, its owner, the starting date of collection and the number and the main geographic origin of specimens, the address where the herbarium is preserved, the kind of management (including pest control), and other questions about the dissemination of data in the past, and the availability of the owner to share the data (Table 1).

In order to disseminate our initiative we used the mailing list of the working group for floristics, systematics and evolution of the Italian Botanical Society (*Gruppo per la Floristica, Sistematica ed Evoluzione*). In addition we used the most common social networks (e.g. Facebook) and the Acta Plantarum forum (http://www.actaplantarum.org/), an Italian website focused on national floristic information; in some cases we also sent e-mail messages to personal addresses.

Results

Based on our survey, we checked 34 personal herbaria, where 156,361 specimens are currently preserved. A list of personal herbaria, and relative informations, can be freely accessed at https://goo.gl/eJA0Ga. This online checklist will be continuously updated in case that other collectors will send us information about their collections.

The richest herbarium, with 20,000 estimated samples, resulted the *Herbarium Antonietti* (Piedmont) followed by *Herbarium Soldano* (Piedmont, 18,100 samples) and *Herbarium Branchetti* (Emilia-Romagna, 13,000 samples). On the other hand, the herbarium with the lower number of samples resulted the *Herbarium Caetani* with 38 specimens (Table 2). The oldest herbarium is the *Herb. Hölzl Norbert* started in 1960 and preserved in Andriano (Bolzano), followed by the *Erbario Soldano* started in 1973, whereas the most recent are *Erbario Pascale* and *Herbarium Caetani* started in 2014.

Concerning the geographic location of the herbaria (Figure 1), Piedmont and Tuscany resulted the two Italian regions with the highest number (8 herbaria each), whereas we obtained no answer from nine regions (Veneto, Friuli Venezia Giulia, Marche, Umbria, Lazio, Abruzzo, Molise, Puglia, and Basilicata). Concerning the regions where most of the specimens were collected, these correspond to the regions where each herbarium is preserved.

Table 1. Questions proposed in the online survey.

Question	Type of answer
Name of the herbarium	free
Owner and email	free
City where the herbarium is preserved	free
Number of preserved samples (add * for estimated number)	free
Are the specimens organized in a database? In case of positive answer, what kind of database?	free
Are you willing to share your data in a free and online database?	yes/no
Are photo/scan of the specimens available?	yes/no
Starting date of the collection	free
Number of taxa (add * for estimated number)	free
Most represented family (and %)	free
Most represented genus (and %)	free
Main country where the samples were collected (and %)	free
Main Italian region where the samples were collected (and%)	free
Type of organization of the collection (e.g. alphabetical order of genera)	free
Has the herbarium some pests? How it is serious?	free
Are the samples subjected to a pest control? What kind?	free
Was the herbarium mentioned in some scientific publications? Could you cite some?	free

Figure 1. Distribution of the 34 surveyed Italian private herbaria.

Table 2. Names and number of specimens preserved in the 34 Italian private herbaria resulted by present study.

Herbarium name as provided by owners	N° of samples
Herb. Antonietti	20,000
Erbario Soldano	18,100
Erbario Branchetti	13,000
Erbario Enzo Bona	13,000
Herb. Hölzl Norbert	12,300
Herb. Ardingo e Franco Picco	8,000
Herbarium A. Ruggero	5,000
Herb. Domina	5,000
Herb. Dellavedova Roberto	5,000
Herbarium Meridianum-Collezione Maiorca-Caprio	4,740
Erbario Merli	4,000
Herb. Calvia	4,000
Herb. Nicola Ardenghi	4,000
Herb. Selvi	3,600
Herb. Croce	3,500
Erbario di Stefano Atzori	3,500
Herb. Cecchi	3,273
Herb. M. Bovio	3,116
Herb. Franco Giordana	3,027
Herbarium Varalda	3,000
Erbario Morelli	2,500
Herbarium Marco La Rosa	2,085
Herbario Gonnelli	2,000
Herbarium Braydense	1,947
HB. G.Pellegrino	1,397
HbGanz	1,300
Herb. Gianguzzi-Palermo	1,200
Herb. Giuseppe Cataldi	1,123
Herb.Tognon	1,000
Herb. Orsenigo	1,000
Erbario Trapanese	800
Herb. Roma-Marzio	600
Erbario Pascale	315
Herbarium Caetani	38

The most represented families resulted Asteraceae (in 24 herbaria) and Poaceae (8 herbaria), whereas the most represented genera resulted *Carex* and *Trifolium* (in 4 herbaria respectively), followed by *Hieracium* (in 3 herbaria).

Regarding the availability to share their own data in a free and online database, 24 collectors (71%) have agreed to this proposal whereas, concerning citations of herbaria in a scientific paper, 29 herbaria (85%) were cited at least once.

Almost all herbaria (93%) have an associated database (41% in Excel, 37% in MS-Access, 7% in FileMaker and 7 % in MS Word, 4% in SQL-compliant DBMS and 4% in other systems); for 13 herbaria (38%) digital photos or scans of the specimens are available. As regards the arrangement of the collection, 16 (47%) collectors are adopting an alphabetical order, 10 (29%) follow Pignatti (1982), 3 other floras (1 Baroni 1907, 1 Fiori 1923–1929, and 1 Tutin et al. 1964–1980), 2 collectors (6%) adopted a geographic criterion, and 3 collectors (9%) did not report any criteria of ordination.

Pest problems afflicted 22 herbaria (65%) of which 13 (59%) show negligible, 9 (41%) intermediate, and none serious problems. About the solution adopted by collectors to prevent/control pests, 50% use freezing methods, 29% use chemical products (mainly para-dichlorobenzene and camphor), 6% a combination of freezing and chemical products and 5% do not adopt any pest control.

A cross-examination of these two questions (entity of the pest and adopted solution) revealed that private herbarium without treatment are always hit by medium (60%) to low (40%) pest problems. On the other hand, chemical treatment resulted slightly more efficient than freezing, whereas herbaria treated both with freezing and chemical treatment have no (65%) or only low (< 35%) pest problems (Figure 2).

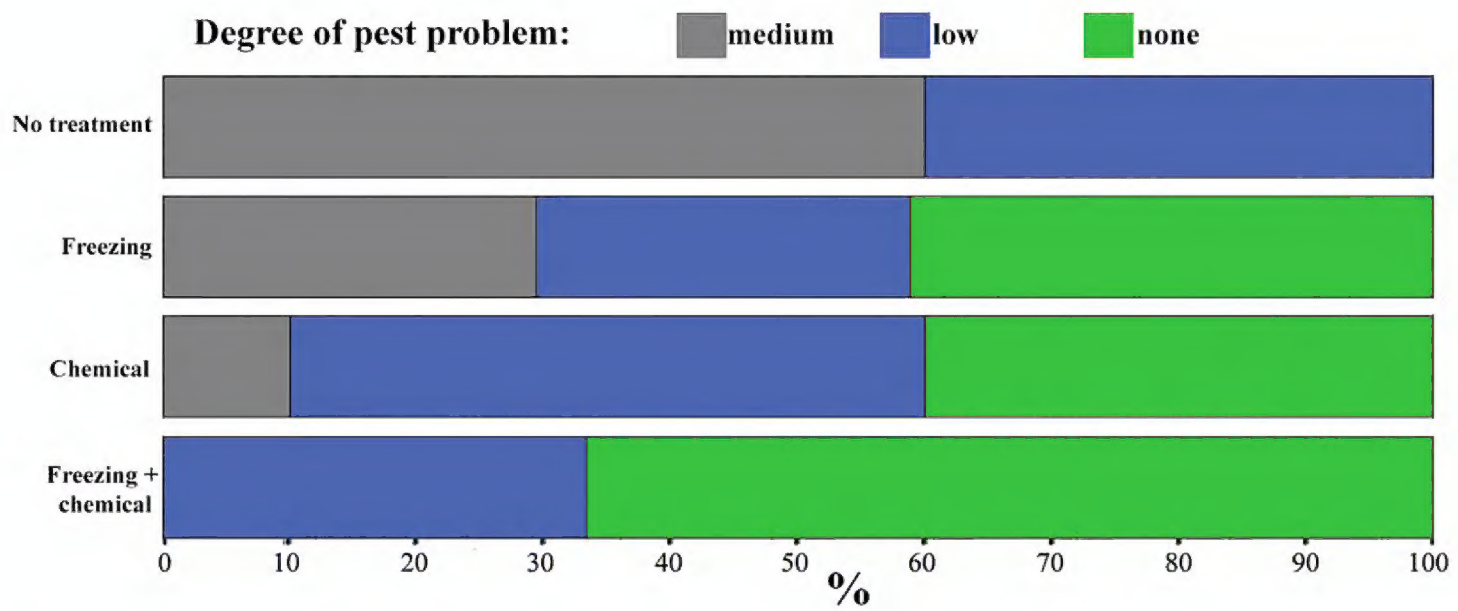

Figure 2. Stacked bar chart showing the relationship between the degree of pest problem and the treatments to prevent it in the Italian private herbaria.

Conclusions

Based on our investigation, about 156,000 specimens are currently preserved in Italian personal herbaria, making this "virtual" herbarium, taken all together, rank 16th among the 68 institutional public herbaria. A very preliminary bibliographic survey revealed that some private herbaria were recently cited in scientific papers (e.g. Anzalone et al. 2010, Iamonico 2015), although the owners did not answer to our survey. For this reason we infer that the real number of specimens preserved in the private collections in

Italy could reach 200,000 or more. For the same reason, the putative absence of private herbaria in central Italy resulting from our investigation could be an underestimation.

We hope that our survey can represent the starting point to re-evaluate the role and the importance of private plant collections, where a remarkable amount of valuable floristic data is currently preserved.

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